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(56) Documents Cited

GB 1515806 A

GB 1223266 A

GB 0580272 A

GB 0418089 A

GB 0264933 A

US 5443195 A

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## (54) Waste removal apparatus

(57) Waste removal apparatus for use in removing unwanted or waste material from a blank or sheet thereof, comprises a pin P with a point 2' at one end thereof and a first portion 1 formed with a slot 1' extending axially along at least part of its length. An associated device T assembled to a mounting plate (BL Fig 3) comprises at least one of the pins P and a strip member S which has at least one side edge received, over at least part of its length, within the slot 1' of the pin P.

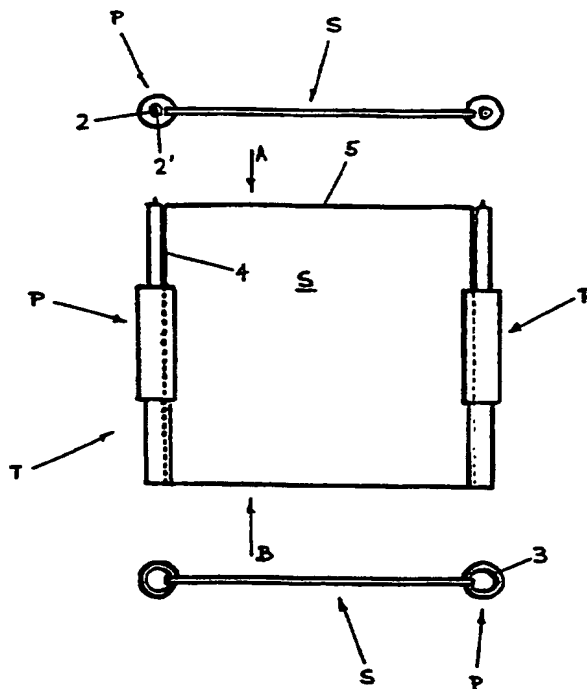


FIGURE 1

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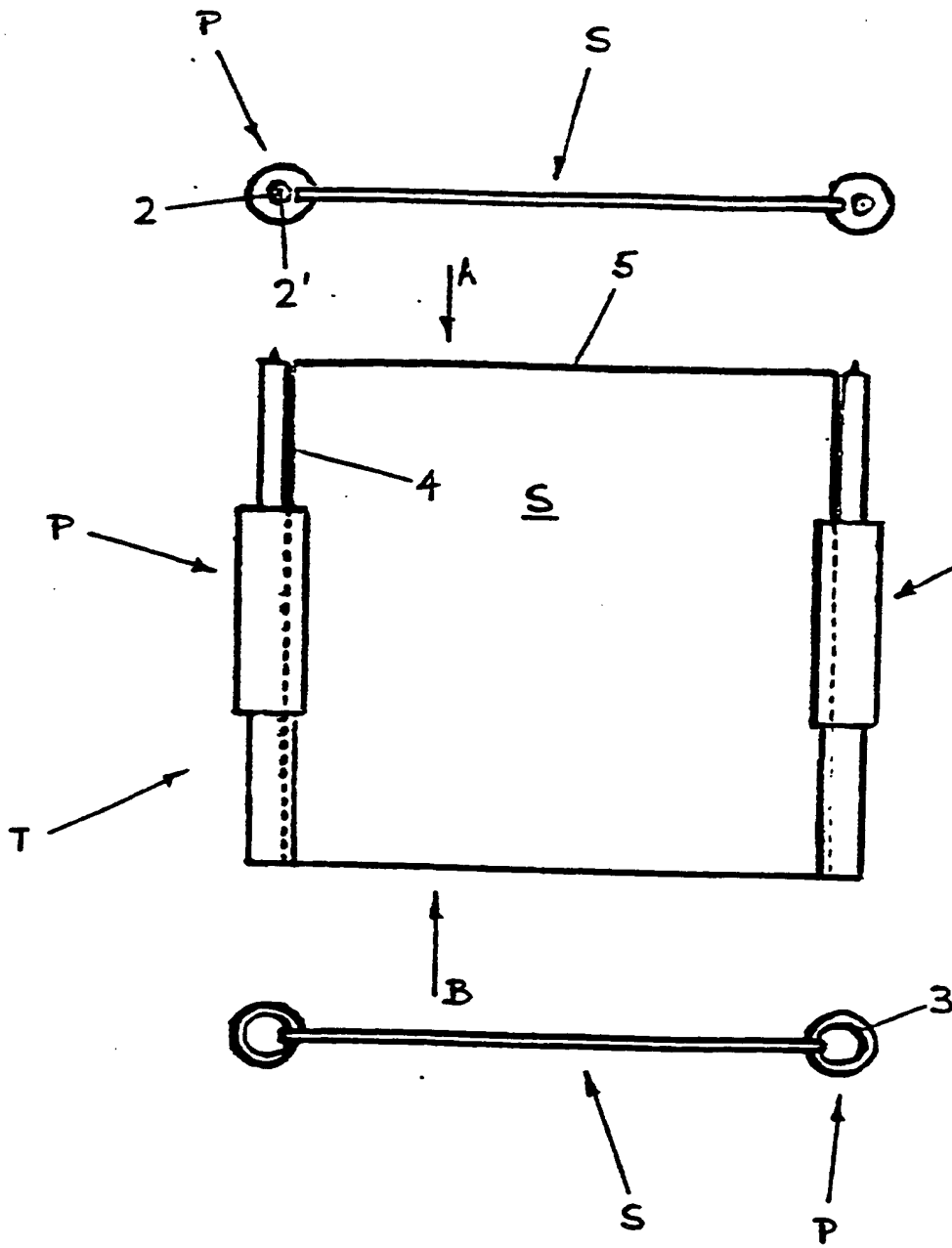


FIGURE 1

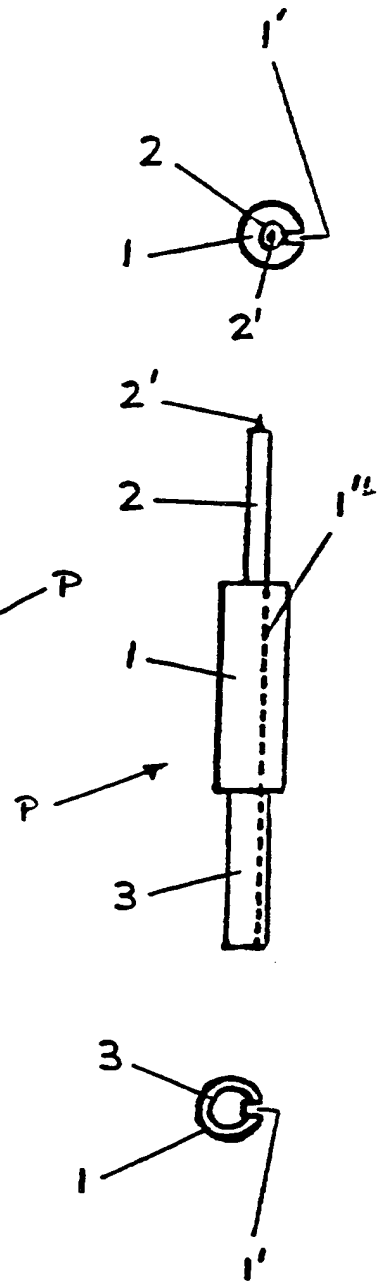
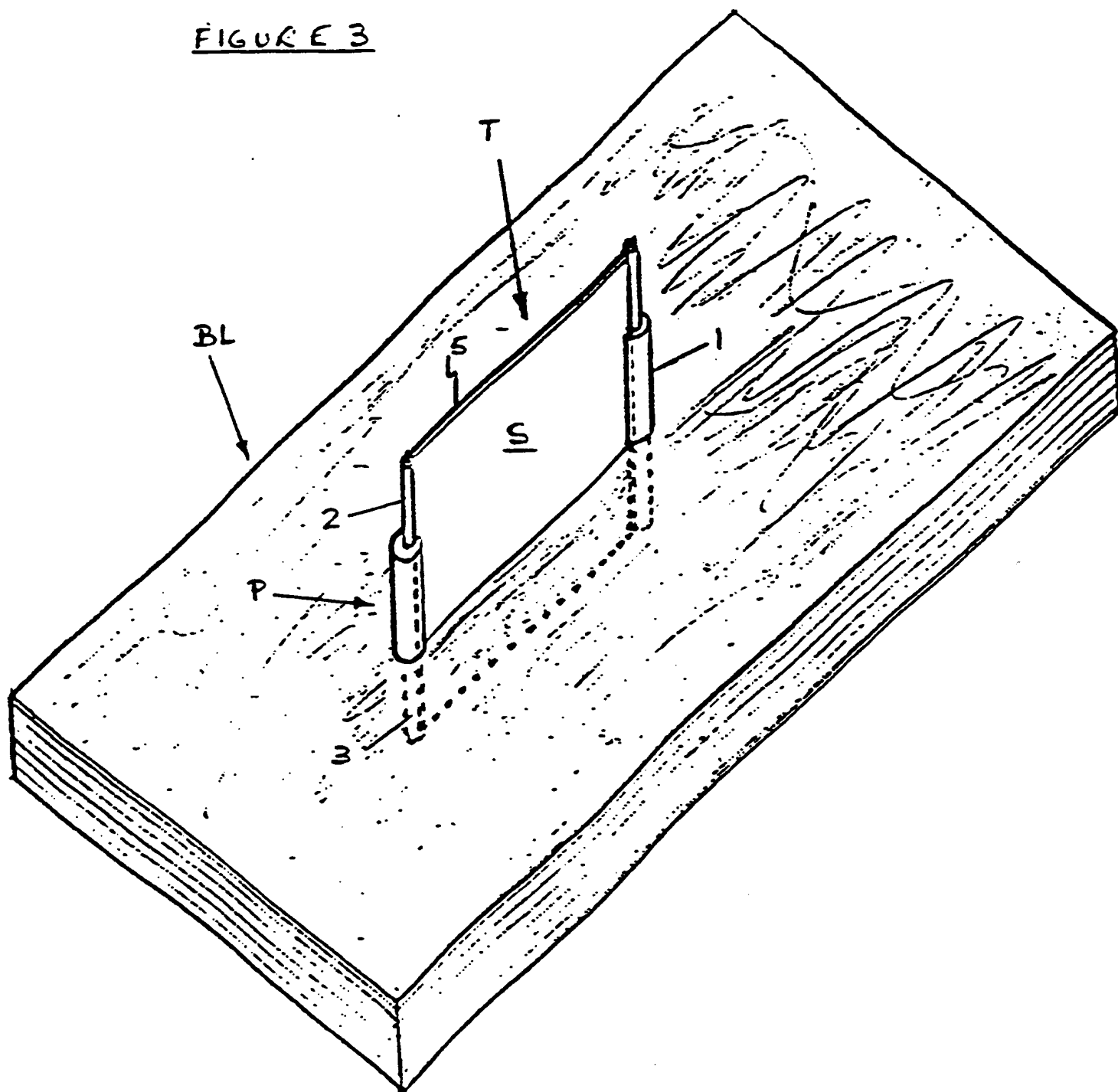


FIGURE 2

FIGURE 3

WASTE REMOVAL DEVICEDESCRIPTION

5       The present invention relates to a device for use in the removal of unwanted or waste material from a sheet or blank of material which has been formed with lines of weakness defining areas from which material is to be removed by the device.

10       The device of the present invention is particularly, but not exclusively, designed for use in removal of unwanted or waste material from a sheet or blank of fibreboard material.

15       In the packaging industry, for example, it is well known to manufacture a sheet or blank of fibreboard material with creases and cutouts so that it may later be formed into a finished product. Initially a cutout is an area of the sheet or blank which has been defined by partially cutting through  
20       the material thereof whilst leaving the material otherwise intact. In a later operation the sheet or blank is supported on a suitable baseplate having therein a hole over which the cutout rests. A tool is then advanced from above towards the supported sheet  
25       or blank and brought to engage the cutout. With continued downward movement by the tool, the cutout is forced to separate from the surrounding material of the sheet or blank at the partial cut-throughs and is pushed down into and through the hole in the  
30       baseplate.

35       The shape and dimensions of the hole in the baseplate, or a corresponding hole in a further plate below the baseplate, are such that, on passage of the cutout through the hole, the cutout is slightly distorted, for example, bent or bowed, out of its

normal plane. When the cutout has been pushed completely through the hole to the lower side of the baseplate or other plate, the inherent resilience of the material from which the cutout is made, causes the cutout to spring back or otherwise return to its normal planar configuration, such that on reverse upward movement of the tool at least part of the peripheral region of the cutout engages a corresponding region of the lower side of the baseplate or other plate at the periphery of the hole, thereby preventing the cutout from returning back through the hole but allowing the tool to disengage from the cutout. The now loose cutout is then collected for subsequent disposal.

15

Known in the art are several different forms of device for removing the cutouts as described in the foregoing paragraph. Previous workers in the art have developed particular forms of the baseplate and/or of the tool for pressing out the cutouts. The present invention is particularly concerned with a tool having the latter purpose.

20

One known form of such tool comprises an assembly of one or more elongate, flat-ended pins on a mounting plate. An advance over the flat-ended pin is offered by a similar elongate pin having a concavely ground point at the forward, operative end thereof.

25

Another known form of tool, disclosed in EP-A1-0,523,327, includes a punch made of rectangular strip steel with vertical and horizontal edges, there being a forwardly protruding point at each of the two forward edge corners defined by the juncture of the forward horizontal edge and the respective vertical edge.

30

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These known types of device suffer from several disadvantages. The flat-ended pins do not provide for any positive location of the material of the cutout against lateral movement relative to the pins and, as such, may give rise to imprecise or unclean removal of the material of the cutout from the surrounding material of the sheet or blank. Cleaner, more precise removal of the material of the cutout is provided by resort to the use of the concavely ground pointed pins which penetrate the material of the cutout and thereby give location against lateral movement of the cutout relative to the pins. But this has the attendant disadvantage in requiring a specialised baseplate which has been shown to be highly susceptible to wear, requiring frequent replacement.

On the other hand, the rectangular strip steel punch with forward end points can work out relatively costly because of the need to maintain a large stock of such tools having different widths in order to provide the capability of removing cutouts of varying sizes and diameters. Moreover, the provision of the precisely dimensioned points on the flat strip steel presents a requirement which is difficult to meet without resort to specialised equipment and non-standard production technology, which increases costs.

The present invention aims to eliminate, or at least substantially reduce, these and other disadvantages of the known, prior art devices.

According to a first aspect of the present invention, there is provided a pin for use in removing unwanted or waste material from a sheet or blank thereof, comprising a point at one end thereof and a first portion, preferably of relatively large external



size, formed with a slot extending axially thereof along at least part of its length.

5 According to a second aspect, the present invention provides a device for removing unwanted or waste material from a sheet or blank thereof, comprising at least one pin as set forth in the first aspect of the invention and a strip member which has at least one side edge received, over at least part of  
10 its length, within the slot of the pin and which has, optionally, a forward edge adjacent the pointed end of the pin.

15 Preferably the device according to the second aspect of the invention further includes a second pin, similar to the first, and in whose slot a second side edge of the strip member is received, over at least part of its length, with the forward edge of the strip member lying adjacent the pointed end of the second  
20 pin.

25 Preferably the pin as set forth in the first aspect of the invention has a second portion of relatively small external size extending from a forward end of its first portion of relatively large external size preferably terminating adjacent the point at said one end of the pin. Preferably also, the slot extends axially throughout the whole of the length of the first portion. More preferably, the  
30 external surfaces of the first and second portions of the pin are respective surfaces of revolution whose radii differ by an amount which is equal to the depth of the slot as measured from the external surface of the first portion.

35

Preferably, the pin as set forth in the first

aspect of the invention further includes a third portion of relatively small external size than that of the first portion but, optionally, of relatively large external size than that of the second portion. This  
5 third portion may extend from a rearward end of the first portion. Preferably, the slot extends axially also along at least part of the length of the third portion, with, say, the base of the slot in the third portion lying at the same distance from the centreline  
10 (axis) of the pin as the base of the slot in the first portion of the pin. The external surface of the third portion of the pin may also be a surface of revolution whose radius differs from that of the first portion by an amount which is less than the depth of the slot as  
15 measured from the external surface of the first portion.

Preferably the point at the one end of the pin as set forth in the first aspect of the invention is in  
20 the form of a right circular cone whose base diameter is less than the diameter of the second portion of the pin. The cone shape is straight-sided when seen in side view, having a base angle of, for example, from 60° to 85°.

25 The pin and/or device of the first and/or second aspect of the present invention further includes a mounting plate to which the pin(s) and/or strip member are assembled.

30 Preferably, the strip member is a planar, strip blank, advantageously of steel, and the or each pin is of steel.

35 The present invention will now be described in further detail with reference to the accompanying

illustrative drawings which show, by way only of example, a pin and associated device according to the present invention for removing unwanted or waste material from a sheet or blank, and in which:

5

Figure 1 shows a top end view, side elevation, and bottom end view of a device including two elongate pins and a strip steel member;

10

Figure 2 shows a top end view, side elevation, and bottom end view of an elongate pin; and

15

Figure 3 shows, in perspective view, an assembly of two elongate pins, a strip steel member, and a mounting plate.

20

The present invention provides a device for removal of unwanted or waste material from a sheet or blank of material, the device comprising a baseplate (not shown) and a tool T shown in Figures 1 and 3 assembled to a mounting plate BL shown in Figure 3.

25

With reference first to Figure 2 of the accompanying drawings, an elongate pin P comprises a point 2' at one end thereof and a body with a first portion 1 of relatively large external size, the first portion 1 being formed with an elongate slot 1' extending axially thereof throughout at least part of its, but preferably its entire, length. The base 1" of the slot 1' is shown in chain lines in the side elevational view of Figure 2.

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Extending from the forward end, that is the end nearest the point 2', of the first portion 1 is a second portion 2 of relatively lesser external size than that of the first portion 1. Extending from the

rearward end of the first portion 1 is a third portion 3 of relatively lesser external size than that of the first portion 1, but of relatively greater external size than that of the second portion 2.

5

10 The external surfaces of the first portion 1, second portion 2 and third portion 3 of the body of the pin are respective surfaces of revolution about a common axial centreline of the pin. The radii of the external surfaces of the first portion 1 and the second portion 2 of the body of the pin P differ by an amount which is equal to the depth of the slot 1' as measured from the external surface of the first portion 1. The radii of the external surfaces of the first portion 1 and the third portion 3 of the body of the pin P differ by an amount which is less than the depth of the slot 1' as measured from the external surface of the first portion 1. Thus, the elongate slot 1' extends not only throughout the entirety of the length of the first portion 1, but also throughout at least part, preferably the entirety, of the length of the third portion 3; and the base 1" of the slot 1' in the first portion 1 continues uninterruptedly into the third portion 3 whereby the base of the slot in the third portion 3 lies at the same radius from the centreline of the pin as does the base 1" of the slot in the first portion 1 of the body of the pin. This can be seen in the chain lines of Figure 2.

30 The point 2' at the forward end of the elongate pin P is in the form of a right circular cone whose base diameter is less than the diameter of the second portion 2 of the body of the pin. Thus, the cone is of straight-sided shape when seen in side view having  
35 a base angle of, for example, between 60° and 85°.

The pin P as described above is preferably made of steel, and, as shown in Figure 1 of the accompanying drawings, is associated with a strip steel member S to form the tool T. Thus, the tool T  
5 incorporates one, or preferably two, of the elongate pins P as described above, arranged with its (their) pointed end(s) adjacent and aligned with a forward edge 5 of the strip steel member S. The strip steel member S has a side edge 4 which is received, over at  
10 least part of its length, within the slot 1' of a pin P such that, over that region of the side edge 4 which corresponds with the length of the portion 2 of the pin P, the side edge 4 abuts, or closely approaches, the external surface of that portion 2. The forward  
15 edge 5 of the strip steel member S lies substantially in the plane of the forward end(s) of the portion(s) 2 of the pin(s) P, that is substantially in the same plane as the base(s) of the cone(s) of the point(s) 2', so that the point(s) 2' project(s) a little  
20 distance beyond the forward edge 5.

As shown in Figure 1, the strip steel member S preferably also has another, similar side edge 4 similarly received within the slot 1' of the second  
25 elongate pin P. This is, however, optional and the tool T may be comprised of but a single pin P engaged as described with one side edge 4 of a strip steel member S.

30 The tool T is assembled, as shown in Figure 3, to a mounting plate BL such that the third portion 3 of the or each elongate pin P and the corresponding portion of the strip steel member S extending laterally from such third portion(s) 3 are received  
35 within the depth of the mounting plate BL, as shown in chain lines in Figure 3. The shoulder which is

provided at the juncture of the first portion 1 and the third portion 3 of the or each elongate pin P affords a limit stop defining the depth of insertion of the pin(s) P and strip steel member S within the  
5 depth of the mounting plate BL.

As mentioned previously, the device according to the present invention further includes a baseplate (not shown) with which the assembly just described is  
10 associated. The baseplate, which may take any suitable form as known in the art and will not be described in great detail as it forms no significant part of the crux of this invention, comprises one or  
15 more holes for cooperation with the tool T in a manner well-known in the art.

Briefly, the assembly of the tool T and mounting plate BL is arranged in an inverted orientation (relative to that shown in Figure 3) above the  
20 baseplate (not shown) with the tool T vertically aligned with one of the holes in the baseplate. The operative width of the tool T, that is the distance measured from a point on the external surface of the second portion 2 of the body of a pin P and extending  
25 diametrically across such portion 2 and continuing along the forward edge 5 of the strip steel member S to its end remote from the pin P (and, if a second elongate pin P is present, extending also diametrically across the width of its second portion  
30 2 to a point on its external surface remote from the strip steel member S), is selected to be substantially equal to, or less than, the diameter of the aligned hole in the baseplate. Thus, when the assembly of the tool T and mounting plate BL is lowered to approach  
35 the baseplate, the tool will be able to enter the hole in the baseplate with clearance.

Clearly, the operative width (as described above) of the tool T is primarily determined by the length of the forward edge 5 of the strip steel member S. Thus, by appropriate selection of the strip steel member S from a range of such members having different lengths of forward edge 5, a tool T of operative width appropriate to any diameter of hole in the baseplate may be chosen. Since the strip steel member S is essentially a planar, thin blank, it is cheap and easy to hold in stock a range of such members with different forward edge lengths. Also, it is a simple matter to assemble a selected strip steel member S with one or more of the elongate pins P in order to form a desired tool T and then to assemble such tool to the mounting plate BL in the manner described above.

In use, to remove unwanted or waste material from a sheet or blank of material, such as fibreboard, which has been formed with lines of weakness defining a cutout area from which material is to be removed, the sheet or blank is supported on the baseplate such that a cutout to be removed rests over a hole in the baseplate chosen such that its diameter suits the diameter, or largest dimension, of the cutout (in a manner which is well understood in the art). With the sheet or blank so supported, the mounting plate BL with the tool T dependent therefrom is lowered towards the baseplate such that the forward end of the tool T bears upon the cutout to be removed. With continued downward pressure by the tool, the cutout is forced to separate from the surrounding material of the sheet or blank at the partial cut-throughs, and is pushed down into the hole in the baseplate. The point 2' of the each or each pin P of the tool T penetrates the material of the sheet or blank, thus preventing

lateral movement thereof in relation to the tool T, and the forward edge 5 of the strip steel member S exerts pressure on the cutout whilst preventing penetration therethrough by the portion 2 of the pin P. Thus the cutout is forced to separate cleanly and precisely from the surrounding material of the sheet or blank and is then moved downwardly into and through the hole in the baseplate.

Although the hole in the baseplate is generally complementary with the cutout, its shape and dimensions are such that, on its downward passage of the cutout into and through the hole, the cutout is slightly distorted, for example, bent or bowed, out of its normal plane, particularly in at least part of its peripheral region. When the cutout has been pushed completely through the hole to the lower side of the baseplate remote from the mounting plate BL, the inherent resilience of the material from which the blank, and hence the cutout, is made, causes the cutout to return at least partially to its normal planar configuration, but by a sufficient amount, such that on reverse upward movement of the mounting plate BL and tool T, at least part of the peripheral region of the cutout engages a corresponding region of the lower side of the baseplate at the periphery of the hole. This prevents the cutout from being returned back through the hole in an upward direction but causes the tool T to disengage its pin points 2' from the cutout, thereby permitting the now loose cutout to be collected for subsequent disposal or other treatment and the tool T to return to its original position ready for the next cutout removal operation upon a successive blank.

The device according to the present invention is



simple and cheap to manufacture and use. The elongate pin P is readily produced without resort to expensive and accurate machining of any concavely ground pointed end, as known in some prior art pins, whilst the  
5 planar strip steel member S is cheap and easy to produce by stamping from a larger sheet, without the precision required in the prior art strip steel punch having forward end points. The ready selection of an  
10 appropriately wide tool T in accordance with the present invention and as described in the foregoing, without the need to maintain an expensive or large stock of different tools, is a significant advantage offered by the present invention.

15 The present invention is not limited to the particular details thereof given in the foregoing with reference to the currently preferred embodiment thereof, but extends to all variations as are  
20 encompassed within the scope of the appended claims.

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- 5 material from a blank or sheet thereof, comprising a point at one end thereof and a first portion formed with a slot extending axially along at least part of its length.
- 10 2. A pin according to claim 1, wherein the first portion is of relatively large external size.
3. A pin according to claim 1 or 2, wherein the slot extends axially throughout the whole of the length of the first portion.
- 15 4. A pin according to claim 1, 2 or 3, including a second portion of relatively small external size extending from a forward end of the first portion.
- 20 5. A pin according to claim 4, wherein the second portion terminates adjacent the point at said one end of the pin.
- 25 6. A pin according to claim 4 or 5, wherein the external surface of the first and second portions are respective surfaces of revolution whose radii differ by an amount which is equal to the depth of the slot as measured from the external surface of the first portion.
- 30 7. A pin according to any preceding claim, including further a third portion of relatively small external size than that of the first portion.
- 35 8. A pin according to claim 7 when dependent upon

any of claims 4 to 6, wherein the third portion is of relatively large external size than that of the second portion.

5     9.   A pin according to claim 7 or 8, wherein the third portion extends from a rearward end of the first portion.

10    10.  A pin according to claim 7, 8 or 9, wherein the slot also extends axially along at least part of the length of the third portion.

15    11.  A pin according to claim 10, wherein the base of the slot in the third portion lies at the same distance from the centreline (axis) of the pin as the base of the slot in the first portion of the pin.

20    12.  A pin according to any of claims 7 to 11, wherein the external surface of the third portion of the pin is a surface of revolution whose radius differs from that of the first portion by an amount which is less than the depth of the slot as measured from the external surface of the first portion.

25    13.  A pin according to any of claims 4 to 12, wherein the point at said one end of the pin is in the form of a right circular cone whose base diameter is less than the diameter of the second portion of the pin.

30    14.  A pin according to claim 13, wherein the cone shape of the point is straight-sided when seen in side view.

35    15.  A pin according to claim 13 or 14, wherein the base angle of the cone is from 60° to 85°.

16. A pin according to any preceding claim, including a mounting plate to which the pin is assembled.
17. A pin for use in removing unwanted or waste material from a blank or sheet thereof, substantially as hereinbefore described with reference to the accompanying drawings.
18. A device for use in removing unwanted or waste material from a sheet or blank thereof, comprising at least one pin according to any preceding claim and a strip member which has at least one side edge received, over at least part of its length, within the slot of the pin.
19. A device according to claim 18, wherein a forward edge of the strip member lies adjacent the pointed end of the pin.
20. A device according to claim 18 or 19, including a second pin according to any of claims 1 to 17, in whose slot a second side edge of the strip member is received over at least part of its length.
21. A device according to claim 20, wherein the forward edge of the strip member lies adjacent the pointed end of the second pin.
22. A device according to any of claims 18 to 21, wherein the device is assembled to a mounting plate.
23. A device according to any of claims 18 to 22, wherein the strip member is a planar, strip blank.
24. A device according to any of claims 18 to 23, wherein the strip member and/or pin is of steel.

25. A device for use in removing unwanted or waste material from a sheet or blank thereof, substantially as hereinbefore described with reference to the accompanying drawings.

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Application No: GB 9609389.3  
Claims searched: 1-25

Examiner: Hal Young  
Date of search: 18 July 1996

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): B4B ; D1G(GDF, GDG) ; F2H(HXD, HXP)

Int Cl (Ed.6): B26D(7/18)

Other: ONLINE: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	GB1515806 (WUPA) see whole document.	18
X	GB1223266 (SENCO) see figs 1-3.	1-5 at least
X	GB580272 (HAIM) see figs 1-5.	1-5 at least
X	GB418089 (THOMPSON) see figs 1,4,5.	1-5 at least
X	GB264933 (HUMPHRIS) see figs.	1-5 at least
A	US5443195 (KARL) see whole document.	18

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